



**SCOPING DOCUMENT FOR A  
REMEDIAL INVESTIGATION/FEASIBILITY STUDY  
AT THE LONE STAR/REICHHOLD SITE  
SEATTLE, WASHINGTON**

*Prepared For:*

**REICHHOLD CHEMICALS, INC.**  
Tacoma, Washington

*and*

**LONE STAR NORTHWEST**  
Seattle, Washington

*Prepared By:*

**REMEDIATION TECHNOLOGIES, INC.**  
Seattle, Washington

RETEC Project No. 3-2137-210

**OCTOBER 1995**





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**DATE:** October 18, 1995

**JOB NO.:** 3-2137-210

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**SUBJECT:** Lone Star/Reichhold Site

**ENCLOSED PLEASE FIND:** One copy of the *Scoping Document for a Remedial Investigation/Feasibility Study at the Lone Star/Reichhold Site, Seattle, Washington.*

**REMARKS:**

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**SHOULD YOU HAVE ANY QUESTIONS, PLEASE FEEL FREE TO CALL ME.**

**SINCERELY,**

**REMEDIATION TECHNOLOGIES, INC.**

  
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RETEC File No. 3-2137-210

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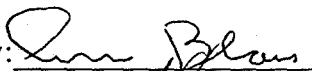
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Seattle, Washington

*Prepared By:*

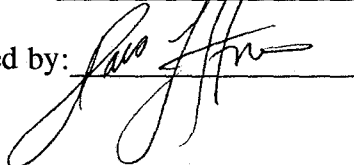
**REMEDIATION TECHNOLOGIES, INC.**  
Seattle, Washington

RETEC Project No. 3-2137-210

Prepared by:



Reviewed by:



**OCTOBER 1995**

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## 1.0 INTRODUCTION

This scoping document outlines the approach for completion of a Remedial Investigation/Feasibility Study (RI/FS) for the Lone Star facility located at 5900 West Marginal Way in Seattle, Washington. Reichhold Chemicals, Inc. and Lone Star Northwest have entered into a settlement agreement regarding this site. One of the conditions of that agreement is to characterize the conditions at the site so that appropriate cleanup measures can be implemented. The parties intend to conduct the investigation and cleanup of the site as an independent remedial action; however, when evaluated as a whole, the action will be the substantial equivalent of an action supervised or conducted by the Department of Ecology. All applicable standards of WAC 173-340 will be applied to this cleanup. This document is submitted to support the settlement agreement and is intended to comply with the requirements for an RI/FS as described in the Model Toxics Control Act (MTCA; WAC 173-340).

This scoping document was developed after a review of the existing information regarding historical site operations, results of previous subsurface investigations and discussions with Lone Star and Reichhold personnel. The parties have a very complete understanding of the operating history of the site, developed from 2 years of pre-trial discovery. This information allows for a targeted site investigation to identify and characterize source areas and migration pathways of the contaminants identified at the site. The results of the investigation will be compared to applicable standards, and an analysis of potential risks will be developed based on likely future land use. Cleanup options will then be developed for those media that are found to exceed applicable standards and pose an unacceptable risk to human health or the environment.

This document is organized in seven sections. Section 2 presents a site description including the operational history. Section 3 summarizes the previously conducted site investigations. Section 4 presents the objectives of the RI/FS and Section 5 outlines the proposed RI/FS scope of work. Section 6 presents a schedule for implementation of the field investigation. References cited in this proposal are listed in Section 7.

## **2.0 SITE DESCRIPTION**

The Site is an 18-acre parcel located in Seattle, King County, Washington. The Site is bounded by West Marginal Way to the west and the Duwamish River to the east. North and south of the site are adjacent industrial properties. The current layout of the site and property boundaries are shown in Figure 2-1.

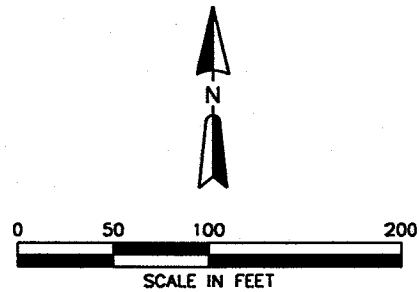
### **2.1 Ownership and Operational History**

#### **2.1.1 Site Ownership**

The earliest known industrial operations at the site commenced in 1943. From 1943 to 1947, the U.S. Army owned and operated the site for charcoal filter production. Reichhold leased the site from the Army from 1947 to 1960. Reichhold operations involved the production of resins, a pilot-scale production of pentachlorophenol, and sodium pentachlorophenate. Reichhold moved their operations to Tacoma in 1960, and the site apparently remained inactive until 1964. In 1964, ownership was transferred to the Port of Seattle who leased the property to Kaiser Cement Company who operated a cement terminal. Kaiser purchased the property in 1969 and continued their operations until 1987 at which time Lone Star Northwest assumed ownership. Lone Star Northwest is the current property owner and continues to operate a cement terminal at the site and leases portions of the property to other non-industrial operations.

#### **2.1.2 Operational History**

The operations of primary interest for the RI/FS are those associated with the former Reichhold facility. This focus is appropriate because previous site investigation data (see Section 3) indicate that releases of hazardous substances from the Reichhold operations may have occurred, and these constituents (primarily pentachlorophenol) are still present in site groundwater. Available information regarding past operations includes a 1954 plot plan of the former Reichhold plant site, internal correspondence and papers that discuss the operations of the Seattle plant and of similar Reichhold operations, various photographs of the site, and volumes of deposition testimony and other information developed for trial. This information provides a very complete picture of the on-site operations.



**PEN-2790**

SITE MAP

REICHHOLD/LONE STAR FACILITY

**RETEC**  
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 DRAWING NO. **FIGURE 2-1** REV. **0**

The Reichhold Seattle plant produced synthetic resin glues for use in plywood manufacturing. It also was used for pilot-scale production of pentachlorophenol and sodium pentachlorophenate. Pentachlorophenol was made by combining phenol and chlorine in batch reactors. It was then stored in 55-gallon drums to dry and later used in developing the sodium pentachlorophenate production process. Sodium pentachlorophenate was made by combining pentachlorophenol and sodium hydroxide in a 500-gallon batch reactor. Phenol was used for some of the resin production; the resin products included formulations of phenol-formaldehyde, urea-formaldehyde and resorcinol-formaldehyde.

Much of the production equipment was transferred from Seattle to Reichhold's Tacoma plant in 1960. Remaining facility structures were demolished in 1969 by Kaiser.

## **2.2 Waste Management Practices and Potential Source Areas**

There are several documents describing the waste management practices at the plant. Based on these memos and the 1954 plot plan, several areas can be identified as potential source areas warranting further investigation. Each area is located on Figure 2-1 and described below.

### **2.2.1 Tank Farm**

The tank farm is shown on the 1954 plot plan and is evident in aerial and plant site photographs. Ten tanks, used to store various raw materials and finished products, were located in an area encircled by a containment wall but with no floor. This area was used to store solid and semi-solid wastes including phenol-containing waste. Soil sampling conducted by Reichhold in 1958 indicated that soils within the tank farm contained phenol. Although soil removal was discussed in internal memos, there is no documentation of whether or not this action was completed.

### **2.2.2 Wastewater Impoundment**

A wastewater impoundment was located in the western-central portion of the site (Figure 2-1). The impoundment is not depicted on the 1954 plot plan but is evident in aerial and plant site photographs. The impoundment is reported to have been constructed by Reichhold in 1955 (Parametrix, 1985) and closed in 1960 (Hart Crowser, 1995). The impoundment received primarily hydrochloric acid, a by-product of the pilot-scale pentachlorophenol production.

### **2.2.3 Water Treatment Tank**

A waste treatment tank was located near the river (Figure 2-1). The waste tank apparently received wastes from the entire facility. It appears that the original shoreline has shifted or eroded, and the area that contained the tank no longer exists. There is evidence that the tank overflowed at times, and it may have been constructed without a bottom.

### **2.2.4 Pentachlorophenol Pilot Area**

The first pentachlorophenol pilot plant was operated for a brief period of time next to the formaldehyde production process (Figure 2-1). A second pilot plant was later established just north of the pentachlorophenolate production area.

### **2.2.5 Pentachlorophenolate Production Area**

The area of sodium pentachlorophenolate production is shown on Figure 2-1. Facilities identified as potential sources of phenol in the wastewater include: the kettle room area, the pentachlorophenol solution room, and the phenolate drying area. The original pentachlorophenol pilot plant was moved to this area (immediately north of the pentachlorophenolate area).

### **2.2.6 Septic Tank**

The septic tank is located in the northern portion of the site. It is included here as a potential source because it received discharges from the control and resin laboratory. There is evidence that the septic tank would, on occasion, overflow.

### **2.2.7 Ditches**

Ditches on-site carried wastewater and stormwater runoff to the Duwamish River. The central and southern ditches carried wastewater from the production and tank storage areas. These ditches were apparently blocked in the mid-1950s.

### **2.3 Regulatory History**

The site was listed by Ecology on the Hazardous Site Register in August, 1991. The site was given a ranking of 1 (representing the highest risk site). This ranking was based on results of previous site investigations (Parametrix, 1985 and 1990). Additional data were reported to Ecology in August 1995; that correspondence included recommendations for further work (Hart Crowser, 1995).

### 3.0 SUMMARY OF PREVIOUS REMEDIAL INVESTIGATIONS

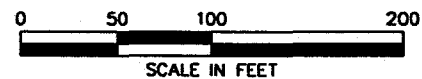
Subsurface investigations have been conducted in the past to support planned construction activities and transfers of property ownership. The results of the previous remedial investigations are summarized below. Figure 3-1 shows the location of the previous points of investigation at the site.

#### 3.1 Subsurface Conditions

Subsurface conditions at the site have been characterized through the completion of several geotechnical investigations and two environmental investigations. The geotechnical investigations were conducted by Shannon and Wilson in 1964, 1966 and 1969, and by Hart Crowser in 1975 (Figure 3-1). The environmental investigations of the subsurface were completed by Parametrix in 1985 and 1990. Figure 3-2 indicates locations of previous environmental sampling efforts. From these efforts, a total of 13 geotechnical borings, 5 cone penetrometer probes and 5 environmental borings are available which describe the subsurface stratigraphy. Note that other shallow sampling efforts (i.e., within the upper 5 feet) have been completed; these are not included here because of their limited depth. Each of the logs reviewed are provided in Appendix A. Based on these data, the following observations can be made with regard to the subsurface conditions at the site:

- The site is underlain by 3 to 5 feet of variable fill material overlying alluvial and marine deposits consisting of sand and silt. The fill is comprised of mixed sand and gravel with some sawdust and concrete debris. A 3- to 4-foot-thick layer of soft clayey silt is present throughout the site, at a depth of 8 to 13 feet below ground surface (bgs).
- A shallow perched groundwater unit may be present seasonally at the site. This shallow unit exists above the clay layer and has been encountered at 4 to 13 feet bgs. A second groundwater bearing zone exists in the alluvial sands below the clay layer.
- The shallow, perched water may discharge to the Duwamish River through intertidal seeps. On a regional basis, the deeper groundwater flows to the northeast to the Duwamish. Regionally, an upward vertical gradient has been reported between the shallow and deeper zones.



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### 3.2 Chemical Analysis - Soil

Soil samples were collected for laboratory analysis by Parametrix in 1985 and 1990 (Figure 3-2). The 1985 effort was a screening level program and 24 samples from 12 different borings locations were composited to form 4 samples for laboratory analysis. The composite samples were analyzed for a wide range of compounds include volatile and semivolatile organics, metals, PCBs and pesticides. The metals detected were generally in the range of natural background concentrations. No volatile organics were detected and the only detected semivolatiles were phthalates - common laboratory contaminants. Three common pesticides were detected at low concentrations. Although the sampling scheme that was used limits the specificity that can be applied to these results, the data do indicate that the site is free of wide-spread contamination by metals or organic compounds.

In May and June, 1990, additional soil samples were collected by Parametrix from three borings and from shallow test pits at the site. A sample was obtained from each boring at 4 and 8 feet bgs, and a composite sample was formed to represent the full depth of the boring (15 or 20 feet). One soil sample was collected from each shallow test pit location. The soil sampling results indicate that TPH and arsenic are potential compounds of interest. TPH was reported to be elevated (10,000 mg/kg) in one soil sample (TP-3). Arsenic was elevated above background in some soil samples; the maximum reported arsenic concentration was 150 mg/kg (below the MTCA Method C soil cleanup level of 200 mg/kg).

The three boring composites and three of the shallow test pit samples were subjected to analysis for metals using the Toxicity Characteristic Leaching Procedure (TCLP). Although this is a regulatory test method developed to assess the suitability of materials for landfill disposal, it can be useful in assessing potential risks posed by the leaching of compounds from soil to groundwater at a site. All six samples contained leachable concentrations of arsenic (0.006 to 0.6 mg/l) and five contained leachable barium (0.05 to 0.18 mg/l). The TP-3 sample also contained leachable cadmium and lead; the reported concentrations were equal to the analytical detection limits of 0.01 mg/l and 0.1 mg/l, respectively. These data indicate that the sampled soils are not characteristically hazardous or dangerous wastes under EPA or Ecology regulations.

### 3.3 Chemical Analysis - Groundwater

Three shallow monitoring wells were installed and sampled in 1990 (Figure 3-2). One well (B-1), is located on the western portion of the site to represent background conditions and the other two wells were located in the eastern portion of the property near the shoreline. Since the groundwater gradient has not yet been confirmed at this site, upgradient and downgradient can only be presumed at this time. The three wells were drilled at depths of 15 and 20 feet bgs and the screened interval lies largely within the silty clay layer. Samples were analyzed for metals and for volatile and semivolatile organic compounds. The two eastern wells were sampled twice and the second set of samples was analyzed only for pentachlorophenol.

The only organic compounds detected were reported present in well B-2, located near the former Reichhold impoundment near the eastern property boundary. Pentachlorophenol was the organic compound detected in highest concentration with reported values of 2,800 and 3,000  $\mu\text{g/l}$  in the two rounds. Several metals were detected in one or more wells; the background well B-1 contained more detected metals than did the two presumed downgradient wells. Arsenic was the only metal that was detected in the two downgradient wells and was absent in the sample from the background well. All three wells contained silver, suggesting a background contribution or off-site source. Initial sampling of intertidal seeps, which apparently discharge from the perched groundwater, suggested that the contaminants of interest were present at concentrations well below Ambient Water Quality Criteria.

### 3.4 Summary and Identification of Data Gaps

The geologic conditions at the site have been well characterized through the previous geotechnical investigations. Previous investigations have also provided a general understanding of the site hydrogeology, and have indicated there are limited areas of groundwater impacted by arsenic, silver and chlorophenols (primarily pentachlorophenol). The site-specific hydrogeologic regime is not well characterized, although a substantial amount of regional data exists to support a general depiction of groundwater flow paths. Unless the previously detected groundwater contamination is found to be extremely limited in extent, further delineation of the site-specific groundwater flow regime will be required to support remedy selection and remedial design.

The site investigations completed to date indicate that pentachlorophenol may have impacted the shallow groundwater at the site, particularly beneath the former impoundment. The

extent of impacted groundwater is unknown in both the horizontal and vertical direction. Other potential source areas have been identified by reviewing site history data. Little or no sampling has been completed in these areas to determine whether there are any additional impacted areas or if there are any source areas remaining at the site.

The site investigation results also indicate that arsenic may be a site contaminant; there is no indication, however, of a historical source of arsenic. Silver is elevated in groundwater samples across the site; an off-site source is suspected but this needs to be confirmed. TPH was detected at significant concentration (10,000 mg/kg) in a single soil sample; confirmation of this sample and, if necessary, further delineation of the extent of TPH impacted soil may be required.

## **4.0 OBJECTIVES OF THE RI/FS**

Work performed in conjunction with the RI/FS will complement and incorporate existing site information and will fill the data gaps that have been identified. The overall objectives for planned site investigation will be to obtain the data needed to assess the risks posed by the site to human health and the environment, and to then select and design any needed remediation. Based on the available data, the risks posed by the site are estimated to be relatively low, because the primary receptor of site contaminants (the Duwamish River) does not appear to currently be impacted. For example, sediment quality data near the site has shown no evidence of chlorinated phenols. However, the determination of the need for remediation and the design of any remediation system(s) cannot be completed without further site data.

The specific objectives of the investigation will be:

1. Determine the soil quality and volumes of any impacted soils within the suspected source areas (identified in Section 2) in order to assess direct contact risks and to determine if impacted soils are a potential source of groundwater contamination.
2. Further delineate the concentrations of pentachlorophenol in groundwater in the perched water and in the underlying aquifer at the site.
3. Characterize groundwater flow patterns and the nature and extent of contaminant migration within the groundwater.
4. Determine if the silver and arsenic groundwater concentrations are indicative of local background quality.
5. Confirm the presence of TPH in soil near the one elevated sample and, if requested, assess the extent of any such contamination.

Upon completion of the site investigation efforts, the results will be reviewed to identify any potential hot spot or source areas and to compare overall site concentrations to MTCA cleanup levels. Identification of the primary migration pathways and receptors associated with any identified site contaminants is a critical step in developing a sound risk-management scenario for site cleanup. The proposed pathway-receptor analysis will provide the foundation for determining the need for remedial action and for developing cleanup levels or "action" levels. The cleanup levels will be developed using applicable environmental standards (e.g., surface water quality standards) and the risk-based procedures presented in MTCA. At this time, it does not

appear that a detailed baseline risk assessment is necessary to adequately evaluate the appropriate remedial actions.

The objective of the FS is to develop and evaluate a range of remedial alternatives for each contaminated medium, and to develop a set of recommended remedial actions to be taken at the facility. Remedial options for hot spots or source areas will include removal (with associated on-site or off-site treatment/disposal) and containment measures. In the absence of hot spots or source areas, the remedial options will likely focus on containment and monitoring measures. FS reporting will be conducted in two phases. A preliminary FS report will be prepared to present general goals and objectives for site cleanup, review and screen technologies that may be applicable for the site, and then develop a limited set of remedial alternatives that warrant further investigation. A detailed analysis of the agreed-upon alternatives will then be prepared for the final FS.

## **5.0 RI/FS SCOPE OF WORK**

The RI/FS will consist of a set of inter-related tasks or work items. Initial tasks will include finalizing this scoping document and preparing additional RI/FS planning documents. Field investigations will then be conducted to define source areas and assess groundwater quality and flow characteristics. These data will then be used to define cleanup requirements and goals and to define and evaluate cleanup options for the site.

### **5.1 Task 1 - Prepare Planning Documents**

Once the RI/FS scoping document is approved by Reichhold and Lone Star, additional documents will be developed in accordance with Ecology requirements and EPA guidance documents. These documents will present the objectives of the RI/FS activities and will provide detailed procedures for completing the work. The plans to be developed are the RI/FS work plan, the Sampling and Analysis Plan and the Health and Safety Plan.

The RI/FS work plan will be based on the MTCA guidelines (WAC 173-340). The work plan will include a project management plan, site description, detailed site characterization plan for addressing data gaps, a sampling and analysis plan for the field work and a site-specific health and safety plan for site workers. The work plan will describe how the site characterization data will be linked to the pathway-receptor analysis and the FS. The FS portion of the RI/FS work plan will be developed in accordance with WAC 173-340-350 and will include:

- A preliminary discussion of remedial action objectives.
- A discussion of how volumes or areas of media potentially requiring remedial action will be identified.
- A discussion of how screening criteria will be developed to identify and select treatment technologies and process options.
- The criteria for and selection of remedial action alternatives.

## **5.2 Task 2 - Conduct Field Sampling**

The field sampling program will be completed to further assess groundwater conditions and delineate specific constituents in soil. The RI scope will include: 1) soil explorations in suspect source areas; 2) groundwater quality investigations, including the installation and sampling of wells; and 3) aquifer testing to evaluate the hydrogeologic regime.

### **5.2.1 Source Area Investigations**

Seven known or suspected source areas have been identified at the site based on historical operations and previous investigation results. Test pits and/or borings will be advanced within each area to allow collection of soil samples for laboratory analysis and, in some cases, the installation of groundwater monitoring wells. Geoprobe equipment and field test kits for pentachlorophenol will be used where possible to minimize costs and maximize the usefulness of the data, since exact locations of former facilities may be difficult to locate. All collected soil samples will be analyzed for chlorinated phenolic compounds, arsenic and silver. A total of 40 samples from 16 locations are proposed to be obtained for the source characterization efforts (Figure 5-1 shows the proposed sampling locations). The scope of proposed additional investigations in each area are described below.

Tank Farm Investigation. Shallow soils were sampled by Reichhold in 1958 and were reported to contain phenol. It is not known whether these soils were removed, although it was contemplated by Reichhold. To investigate the tank farm it is proposed that three shallow test pits be installed and sampled. Each test pit would be advanced to a depth of 6 feet. Soil samples will be collected from the upper 2 feet (selected to characterize the soil that on-site workers may come into contact with) and from a depth of 4 to 6 feet bgs (selected as the general extent of the fill and the beginning of the native soils). Each of the six soil samples collected from the tank farm will be analyzed for chlorinated phenols, arsenic and silver. One sample will also be analyzed for formaldehyde.

Wastewater Impoundment Investigation. Although there has been some sampling in the impoundment, the data are limited because of the compositing scheme used. Because previous groundwater data points to the impoundment as a potential source area, more investigation of the soil and groundwater here is warranted. Three test pits would be advanced and sampled as described above. Two shallow borings and one deep boring would then be advanced for the purposes of soil sampling and well installation. The shallow wells will be completed within the

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FENCE LINE

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FORMER STRUCTURES

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PROPOSED SHALLOW TEST PIT

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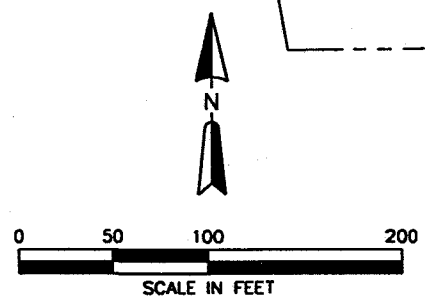
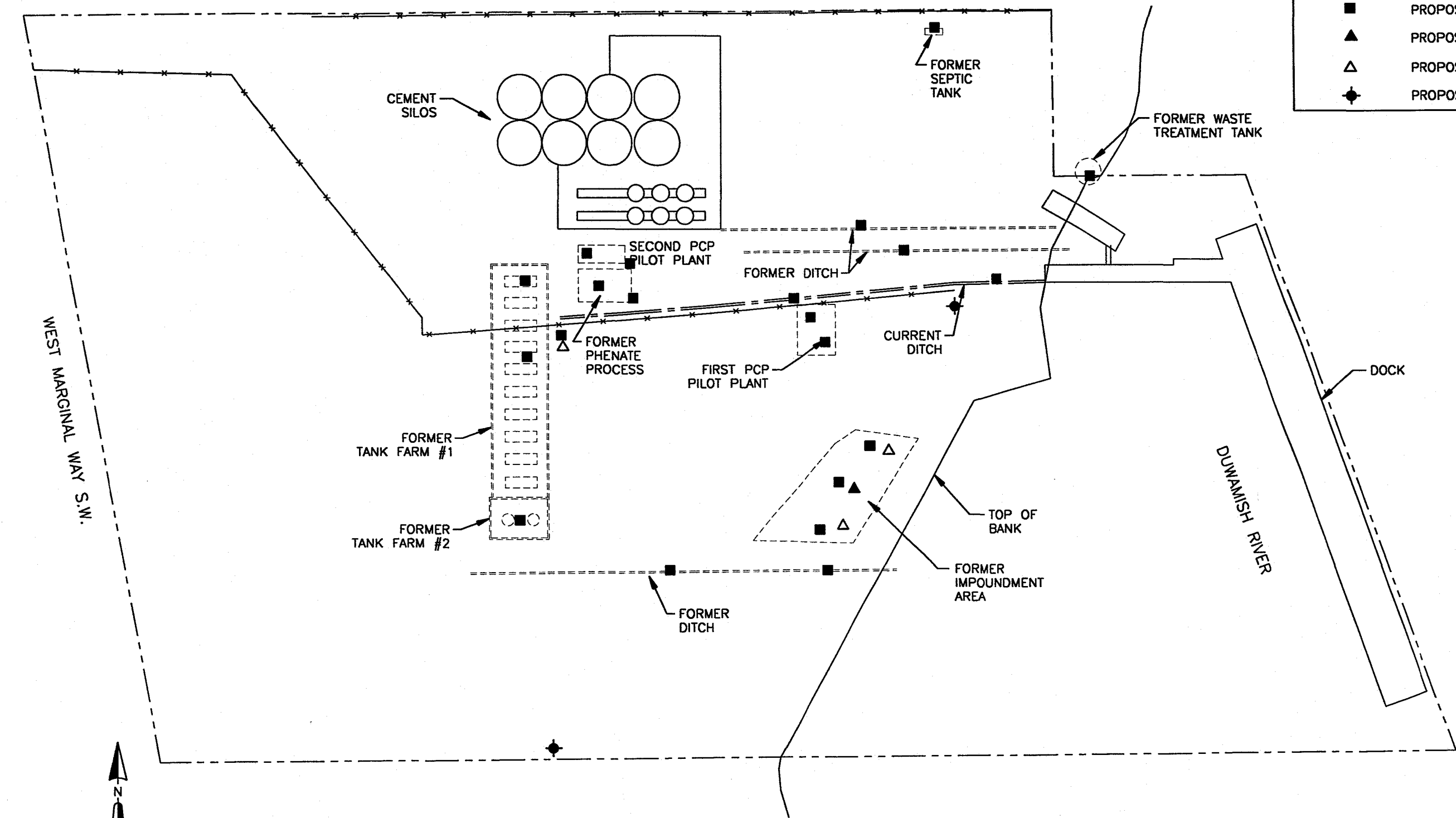
PROPOSED DEEP BORING/WELL

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PROPOSED SHALLOW BORING/WELL

◆

PROPOSED WELL NEST



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PROPOSED SAMPLING LOCATIONS

REICHHOLD/LONE STAR FACILITY

RE/TEC

REMEDATION TECHNOLOGIES INC

DRAWING NO. FIGURE 5-1

REV. 0

within perched zone; the boring would be drilled to the top of the silt layer, or about 10 feet below grade. The one deep boring will be advanced through the silt layer and the well will be completed to screen the lower aquifer; it is expected that this well will be about 25 feet deep. Soil samples will be collected from the screened interval of each well for laboratory analysis. The nine samples obtained from the impoundment area will be analyzed for chlorinated phenols, arsenic and silver.

Water Treatment Tank. The former tank area is of limited accessibility due to its location along the bank and property line; either a test pit or boring will be installed depending upon access. Sample collection and analysis will be as described above.

Pentachlorophenolate Production Area. The pentachlorophenolate production area is located along the access road to the Lone Star terminal operations. Access requirements and restrictions will need to be determined to select the appropriate sample collection techniques. Either two test pits or two shallow borings are envisioned, with two samples collected from each. A shallow boring will also be advanced immediately south of this area, and then completed as a well within the perched zone. This well will be sampled and installed as previously described. Two borings are also planned for the relocated pentachlorophenol pilot area just north of the phenolate production area. This area is currently under concrete. One sample will also be taken south of the area, near the one elevated TPH sample from the 1990 sampling. This sample will be analyzed for TPH in addition to metals and chlorinated phenolate.

Original Pentachlorophenol Pilot Area. Two test pits are proposed for this area. The test pits will be installed and sampled as previously described. A sample from one test pit will also be analyzed for formaldehyde.

Septic Tank. One test pit is proposed for this area with sampling and analysis as described above.

Ditches. The three former ditches and the current stormwater ditch will be examined through a test pit and/or boring sampling effort. Two of the former ditches lie within the Lonestar terminal operation and access requirements and restrictions need to be determined. At least one sample location is proposed to be selected from each of the two former ditches to the north. Two sampling locations are proposed for the current ditch and two for the former ditch to the south. Two samples would be collected from each of the six ditch locations for laboratory analysis. All samples will be analyzed for chlorophenols, silver and arsenic.

### **5.2.2 Groundwater Investigation**

The groundwater investigation will include the collection of groundwater samples for laboratory analysis and the collection of groundwater elevation measurements for analysis of groundwater flow paths. Three shallow wells and one deep well are proposed to be installed for the purposes of the source area investigation. Additional wells are needed to define groundwater flow paths. Four additional wells are proposed to be installed at two locations to further assess groundwater flow. Each location will include one shallow and one deep well. One well nest location will be along the southern property boundary (upgradient of the impacted areas) and the other will be located along the fence line in the eastern portion of the site.

Groundwater samples will be collected from each well for analysis of chlorinated phenolics, silver and arsenic (a sample from one shallow well in the wastewater impoundment will also be analyzed for formaldehyde). All eight wells will be sampled on at least two separate occasions to assess the potential for temporal variability. Samples will be collected during the period of low tide.

Water level measurements will be collected during each sampling event. However, these data are of limited usefulness because of the tidally-influenced fluctuations. Therefore, a tidal study will be conducted to evaluate the groundwater migration pathways. The tidal study will be conducted for a 2-day period to determine vertical and horizontal gradients. Pressure transducers will be used in conjunction with data-loggers for the duration of the test.

### **5.3 Task 3 - Prepare RI Report**

After the field program is completed, a report documenting the investigative activities and presenting all data generated, will be prepared and submitted to Ecology for review and comment. An outline of the proposed RI report is provided in Table 5-1.

### **5.4 Task 4 - Prepare Preliminary FS Report**

The preliminary FS report is designed to present the approach to select remedial alternatives for a more detailed evaluation. The document will present the remedial objectives for the site based on the current and expected future site conditions. The assessment of current and

**TABLE 5-1  
DRAFT OUTLINE  
REMEDIAL INVESTIGATION REPORT**

**1.0 INTRODUCTION**

- 1.1 Purpose of Report
- 1.2 Site Description
- 1.3 Site Ownership and Operational History
- 1.4 Waste Management Practices and Potential Source Areas
- 1.5 Regulatory History

**2.0 SUMMARY OF PREVIOUS INVESTIGATIONS**

- 2.1 Subsurface Conditions
- 2.2 Soil Quality
- 2.3 Groundwater Quality
- 2.4 Preliminary Identification of Chemicals of Interest
- 2.5 Identification of Data Gaps

**3.0 REMEDIAL INVESTIGATION OBJECTIVES**

- 3.1 Soil
- 3.2 Groundwater

**4.0 INVESTIGATION METHODS**

- 4.1 Hydrogeological Characterization
- 4.2 Soil Quality
- 4.3 Groundwater Quality

**5.0 INVESTIGATION RESULTS**

- 5.1 Local Hydrogeology
- 5.2 Soil Quality
- 5.3 Groundwater Quality

**6.0 SUMMARY**

- 6.1 Chemicals of Interest
- 6.2 Areas and Volumes of Impacted Soil
- 6.3 Extent of Groundwater Impacts
- 6.4 Conceptual Site Model

future site conditions will consider the findings of the RI and the land use at and near the site. The likelihood of achieving complete cleanup of the site will be assessed; sites with impacted groundwater are generally considered to require long-term care and monitoring. At many sites, complete aquifer restoration has been determined to be technically impracticable. On the other hand, it has been demonstrated that reliance on natural restorative processes can be an effective and protective alternative at some sites. These issues and the options for managing the potential risks associated with the site will be developed and presented in the preliminary FS.

Once remedial objectives are established, the available technologies will be reviewed, to define the technologies most suitable for the site. The technologies that will be reviewed will include actions that fall into the following categories of general response actions:

- Institutional Controls - Deed restrictions that would preclude residential land use or development of an on-site water supply are two frequently used means of restricting exposure to potential site hazards.
- Containment - Use of physical barriers such as caps and walls; use of wells or trenches to provide hydraulic control or divert groundwater from residual contamination; and/or use of innovative biological barriers will be examined as a means of preventing further migration of hazardous constituents.
- Removal - Removal of hot spot source areas (soil or groundwater) will be examined. Options for managing any removed materials, including on-site and off-site treatment and disposal will be discussed.
- In-situ Treatment - Physical/chemical treatment of the hazardous constituents through use of in-situ technologies will be examined. Much of the experience available to-date is based on bench or pilot scale testing; this work is very innovative but progress is being made on some fronts.

The technologies will be reviewed in terms of their applicability to the site given the setting and remedial goals, and the relative costs will be presented. The objective of the preliminary FS will be to define a set of remedial alternatives for the site that will be protective of human health and the environment, will be technically feasible to implement and will be cost-effective.

## **5.5 Task 5 - Prepare Final FS**

The final FS report will present a detailed evaluation of the remedial alternatives selected above. Each alternative selected from the preliminary FS will be subjected to a more detailed analysis including: a discussion of its effectiveness (short-term and long-term); a further review of the factors that may impact its implementation (i.e., physical, legal or other technical uncertainties or limitations); an assessment of the overall protection of human health and the environment that would be achieved through implementation; and a detailed analysis of both the initial, capital costs, and the costs for longer term operations and maintenance. A comparative analysis of the alternatives will be prepared and a recommended remedial action will be proposed. The FS will be prepared in draft form for review by Reichhold and Lonestar and will then be revised for submittal to Ecology. Table 5-2 provides an outline of the FS report.

**TABLE 5-2  
DRAFT OUTLINE  
FEASIBILITY STUDY REPORT**

**1.0 INTRODUCTION**

- 1.1 Purpose of Report
- 1.2 Site Background
  - 1.2.1 Site History
  - 1.2.2 Regulatory History and Previous Investigations
- 1.3 Report Organization

**2.0 SITE FEATURES INVESTIGATION**

- 2.1 Demography and Land Use
- 2.2 Climate
- 2.3 Local Hydrogeology

**3.0 HAZARDOUS SUBSTANCE INVESTIGATION**

- 3.1 Chlorinated Phenols
- 3.2 Metals

**4.0 CURRENT SITE CONDITIONS**

- 4.1 Current Areas and Volumes of Impacted Soil
- 4.2 Current Groundwater Conditions
- 4.3 Conceptual Site Model

**5.0 CLEANUP LEVELS ANALYSIS**

- 5.1 Introduction and Scope
- 5.2 Groundwater
  - 5.2.1 Exposure Assumptions and Potential Cleanup Levels
  - 5.2.2 Identified Chemicals of Interest
  - 5.2.3 Risk Characterization
  - 5.2.4 Preliminary Remedial Action Objectives
- 5.3 Soils
  - 5.3.1 Exposure Assumptions and Potential Cleanup Levels
  - 5.3.2 Identified Chemicals of Interest
  - 5.3.3 Risk Characterization
  - 5.3.4 Preliminary Remedial Action Objectives

**6.0 REMEDIATION GOALS**

- 6.1 Introduction
- 6.2 Cleanup Levels
- 6.3 Points of Compliance

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**TABLE 5-2 (Continued)**  
**DRAFT OUTLINE**  
**FEASIBILITY STUDY REPORT**

6.4 Expectations for Cleanup Actions

7.0 IDENTIFICATION AND SCREENING OF POTENTIAL REMEDIATION  
ALTERNATIVES

7.1 Introduction

7.2 Identification and Screening of Remedial Technologies

7.3 Summary of Applicable Technologies

8.0 DEVELOPMENT OF CLEANUP ALTERNATIVES

8.1 Alternative 1 - No Action

8.1.1 Description

8.1.2 Overall Protection of Human Health and Environment

8.1.3 Attainment of Cleanup Standards

8.1.4 Short-Term Effectiveness

8.1.5 Long-Term Effectiveness

8.1.6 Reduction of Toxicity, Mobility, or Volume

8.1.7 Implementability

8.1.8 Cost-Effectiveness

8.1.9 Community Concerns

8.1.10 Use of Recycling, Reuse, or Waste Minimization

8.2 Alternative 2 - Institutional Controls

8.2.1 Description

8.2.2 Overall Protection of Human Health and Environment

8.2.3 Attainment of Cleanup Standards

8.2.4 Short-Term Effectiveness

8.2.5 Long-Term Effectiveness

8.2.6 Reduction of Toxicity, Mobility, or Volume

8.2.7 Implementability

8.2.8 Cost-Effectiveness

8.2.9 Community Concerns

8.2.10 Use of Recycling, Reuse, or Waste Minimization

8.3 Alternative 3 - Containment

8.3.1 Description

8.3.2 Overall Protection of Human Health and Environment

8.3.3 Attainment of Cleanup Standards

8.3.4 Short-Term Effectiveness

8.3.5 Long-Term Effectiveness

8.3.6 Reduction of Toxicity, Mobility, or Volume

**TABLE 5-2 (Continued)**  
**DRAFT OUTLINE**  
**FEASIBILITY STUDY REPORT**

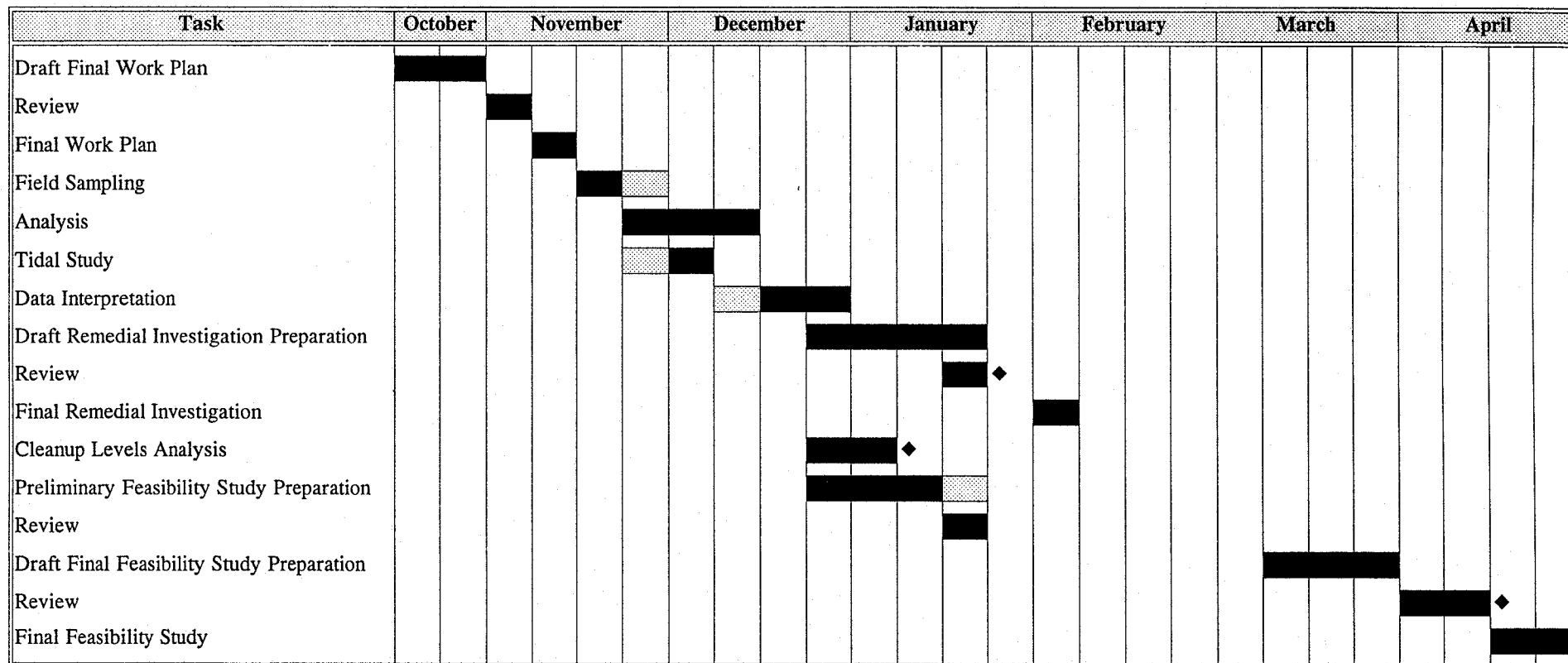
- 8.3.7 Implementability
  - 8.3.8 Cost-Effectiveness
  - 8.3.9 Community Concerns
  - 8.3.10 Use of Recycling, Reuse, or Waste Minimization
  - 8.4 Alternative 4 - Excavation and Off-Site Disposal
    - 8.4.1 Description
    - 8.4.2 Overall Protection of Human Health and Environment
    - 8.4.3 Attainment of Cleanup Standards
    - 8.4.4 Short-Term Effectiveness
    - 8.4.5 Long-Term Effectiveness
    - 8.4.6 Reduction of Toxicity, Mobility, or Volume
    - 8.4.7 Implementability
    - 8.4.8 Cost-Effectiveness
    - 8.4.9 Community Concerns
    - 8.4.10 Use of Recycling, Reuse, or Waste Minimization
  - 8.5 Alternative 5 - Groundwater Extraction and Treatment
    - 8.5.1 Description
    - 8.5.2 Overall Protection of Human Health and Environment
    - 8.5.3 Attainment of Cleanup Standards
    - 8.5.4 Short-Term Effectiveness
    - 8.5.5 Long-Term Effectiveness
    - 8.5.6 Reduction of Toxicity, Mobility, or Volume
    - 8.5.7 Implementability
    - 8.5.8 Cost-Effectiveness
    - 8.5.9 Community Concerns
    - 8.5.10 Use of Recycling, Reuse, or Waste Minimization
  - 8.6 Other Alternatives
- 9.0 CONCLUSIONS AND RECOMMENDATIONS
- 9.1 Site Conditions Following the Interim Remedial Action
  - 9.2 Remediation Objectives
  - 9.3 Preferred Remedial Alternative
- 10.0 REFERENCES

## **6.0 PROJECT SCHEDULE**

The schedule for implementation of the RI/FS is presented in Figure 6-1. Assuming that Reichhold and Lone Star approval of the RI/FS Work Plan is received by the end of October, field work will commence in late November 1995. A three-week period is anticipated to complete the field work. Following receipt of laboratory data generated during the field work, the draft RI report will be completed by mid-February. The final RI report should be completed by mid-March.

The FS will be started as soon as possible after the investigation data have been analyzed. The conceptual FS, discussing cleanup levels and screening applicable technologies, will be completed by early May. The final FS report should be completed by mid-July 1996.

**FIGURE 6-1**  
**SCHEDULE FOR IMPLEMENTATION OF REMEDIAL INVESTIGATION**  
**LONE STAR/REICHHOLD SITE**



NOTES:    ♦ Meeting  
              █ Contingency Available

## 7.0 ESTIMATED COSTS

The costs for the projected scope of work are estimated at approximately \$125,000. A detailed breakdown is given in Table 7-1. This amount includes the previously-authorized amount of almost \$27,000 for developing the detailed work plan. This amount does not include any Ecology oversight and review, because we do not believe it is essential to enter the state's IRAP program at this point.

This estimate is realistic, but it cannot be precise because the actual access to specific areas is not clear, nor is the ability to use less expensive and faster sampling equipment, such as geoprobes. Also, it is possible that an expedited risk assessment, including ecological risks, may be needed, but we have assumed it will not be done based on our current understanding of the potential soil and groundwater quality at the site. A second phase of investigation may also be needed, depending on the outcome of the first investigations. At this point we do not believe it will be needed, but sampling results, particularly from the deeper aquifer, may make further focused investigation necessary.

**TABLE 7-1  
COST BREAKDOWN FOR  
REICHHOLD & LONE STAR**



Description	Quantity	Units	Unit Cost	Mark-Up	Cost
<b>Task 100 - Project Management &amp; Meetings</b>					
<b>LABOR</b>					
Principal in Charge (R11)	40	HRS	125	1.0	5,000
Project Manager (R8)	60	HRS	88	1.0	5,280
Administration (R4)	20	HRS	55	1.0	1,100
<b>MATERIALS &amp; SUPPLIES</b>					
Copies, faxes, mail, etc.	1	LS	500	1.1	550
Communications and Telephone	1	LS	600	1.1	660
<b>Subtotal Task :</b>					<b>12,590</b>
<b>Task 200 - Document Preparation</b>					
<b>Project Management Plan, Site Description, Site Characterization Plan</b>					
<b>LABOR</b>					
Principal in Charge (R11)	8	HRS	125	1.0	1,000
Project Manager (R8)	28	HRS	88	1.0	2,464
Geologist (R3)	40	HRS	48	1.0	1,920
Administration (R4)	12	HRS	55	1.0	660
Drafter (R3)	5	HRS	48	1.0	240
<b>MATERIALS &amp; SUPPLIES</b>					
CAD Equipment and Usage	4	LS	8	1.0	32
Reprographics	1	LS	200	1.1	220
Copies, faxes, mail, etc.	1	LS	800	1.0	800
<b>Subtotal Task :</b>					<b>7,336</b>
<b>Sampling &amp; Analysis Plan</b>					
<b>LABOR</b>					
Principal in Charge (R11)	9	HRS	125	1.0	1,125
Project Manager (R8)	15	HRS	88	1.0	1,320
Geologist (R3)	32	HRS	48	1.0	1,536
Administration (R2)	9	HRS	40	1.0	360
Drafter (R3)	5	HRS	48	1.0	240
<b>MATERIALS &amp; SUPPLIES</b>					
CAD Equipment and Usage	4	HRS	8	1.0	32
Reprographics	1	LS	100	1.1	110
Copies, faxes, mail, etc.	1	LS	800	1.0	800
<b>Subtotal Task :</b>					<b>5,523</b>

**TABLE 7-1  
COST BREAKDOWN FOR  
REICHHOLD & LONE STAR**



Description	Quantity	Units	Unit Cost	Mark-Up	Cost
<b>Health &amp; Safety Plan</b>					
<b>LABOR</b>					
Health & Safety Officer (R9)	2	HRS	98	1.0	196
Geologist (R3)	8	HRS	48	1.0	384
Administration (R2)	4	HRS	40	1.0	160
Drafter (R3)	2	HRS	48	1.0	96
<b>MATERIALS &amp; SUPPLIES</b>					
CAD Equipment and Usage	4	HRS	8	1.0	32
Reprographics	1	LS	50	1.1	55
Copies, faxes, mail, etc.	1	LS	700	1.0	700
<b>Subtotal Task :</b>					<b>1,623</b>
<b>Total Task 200:</b>					<b>14,482</b>
<b>Task 300 - Field Sampling</b>					
<b>Soil Sampling (includes data validation)</b>					
<b>LABOR</b>					
Project Manager (R8)	6	HRS	88	1.0	528
Geologist (R4)	40	HRS	55	1.0	2,200
<b>SUBCONTRACT</b>					
<b>Analytical (includes duplicates)</b>					
Chlorinated Phenols by EPA Method 8240	45	each	144	1.1	7,128
As and Ag by EPA Methods 6000 and 7000 Series	45	each	143	1.1	7,079
Formaldehyde by ASTM Method D15	2	each	45	1.1	99
TPH ID by DOE Method WTPH-HCID	5	each	54	1.1	297
TPH follow-up using WTPH-D extended (if needed)	5	each	81	1.1	446
<b>Drilling (HSA)</b>					
Shallow borings drilled to 10 ft in depth	12	each	300	1.1	3,960
Well Conversion	5	each	400	1.1	2,200
Deep borings drilled to 25 ft in depth	3	each	700	1.1	2,310
Well Conversion	3	each	800	1.1	2,640
<b>Test pits</b>					
Backhoe with operator	1	day	1,500	1.1	1,650
Concrete cutting (5 locations)	1	day	500	1.1	550
Surveying	1	LS	1,000	1.1	1,100
Utility Locating	1	LS	650	1.1	715
Field Meters	5	LS	100	1.1	550
Health & Safety Supplies	5	LS	75	1.1	413
<b>Subtotal Task :</b>					<b>33,864</b>

**TABLE 7-1  
COST BREAKDOWN FOR  
REICHHOLD & LONE STAR**



Description	Quantity	Units	Unit Cost	Mark-Up	Cost
<b>Groundwater Sampling and Tidal Study</b>					
Sampling includes 2 groundwater sampling rounds and data validation					
<b>LABOR</b>					
Project Manager (R8)	6	HRS	88	1.0	528
Geologist (R3)	32	HRS	48	1.0	1,536
<b>SUBCONTRACT</b>					
Analytical (includes duplicates)					
Chlorinated Phenols by EPA Method 8240	18	each	122	1.1	2,406
As and Ag by EPA Methods 6000 and 7000 Series	18	each	75	1.1	1,485
Formaldehyde by ASTM Method D19	2	each	40	1.1	88
Field Meters	4	LS	100	1.1	440
Health & Safety Supplies	4	LS	75	1.1	330
<b>Tidal Study (3 shallow and 3 deep wells)</b>					
<b>LABOR</b>					
Project Manager (R8)	2	HRS	88	1.0	176
Geologist (R4)	20	HRS	55	1.0	1,100
<b>SUBCONTRACT</b>					
Dataloggers, Transducers and Additional cable	6	LS	250	1.1	1,650
<b>Subtotal Task :</b>					<b>9,739</b>
<b>Total Task 300:</b>					<b>43,602</b>
<b>Task 400 - Remedial Investigation Report</b>					
<b>LABOR</b>					
Principal in Charge (R11)	24	HRS	125	1.0	3,000
Project Manager (R8)	80	HRS	88	1.0	7,040
Geologist (R4)	130	HRS	48	1.0	6,240
Administration (R2)	30	HRS	40	1.0	1,200
<b>MATERIALS &amp; SUPPLIES</b>					
CAD Equipment and Usage	30	LS	8	1.0	240
Reprographics	1	LS	500	1.1	550
Copies, faxes, mail, etc.	1	LS	600	1.0	600
<b>Subtotal Task :</b>					<b>18,870</b>

**TABLE 7-1  
COST BREAKDOWN FOR  
REICHHOLD & LONE STAR**



Description	Quantity	Units	Unit Cost	Mark-Up	Cost
<b>Task 500 - Preliminary Feasibility Report</b>					
<b>LABOR</b>					
Principal in Charge (R11)	24	HRS	125	1.0	3,000
Senior Engineer (R9)	40	HRS	98	1.0	3,920
Project Manager (R8)	30	HRS	88	1.0	2,640
Project Engineer (R4)	60	HRS	55	1.0	3,300
Administration (R2)	20	HRS	40	1.0	800
Drafter (R2)	8	HRS	48	1.0	384
<b>MATERIALS &amp; SUPPLIES</b>					
CAD Equipment and Usage	16	LS	8	1.0	128
Reprographics	1	LS	500	1.1	550
Copies, faxes, mail, etc.	1	LS	600	1.0	600
<b>Subtotal Task :</b>					<b>15,322</b>
<b>Task 600 - Final Feasibility Report</b>					
<b>LABOR</b>					
Principal in Charge (R11)	30	HRS	125	1.0	3,750
Senior Engineer (R9)	40	HRS	98	1.0	3,920
Project Manager (R8)	40	HRS	88	1.0	3,520
Project Engineer (R4)	100	HRS	55	1.0	5,500
Administration (R2)	25	HRS	40	1.0	1,000
Drafter (R2)	16	HRS	48	1.0	768
<b>MATERIALS &amp; SUPPLIES</b>					
Copies & Faxes	1	LS	400	1.0	400
Postage/Shipping/Freight	1	LS	200	1.1	220
CAD Equipment and Usage	16	LS	8	1.0	128
Reprographics	1	LS	500	1.1	550
<b>Subtotal Task :</b>					<b>19,756</b>
<b>Project Total:</b>					<b>124,622</b>
<b>Note: This estimate includes \$26,870 already allotted for Task 200 and a portion of Task 100.</b>					
					<b>(26,870)</b>
<b>Additional Budget:</b>					<b>97,752</b>

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